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In Situ Generation of Metal-Oxide Nanoparticles on Top of a Green-Synthesized Tellurium Nanowire Template and the Biomedical Study of the Synergetic Structure

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Abstract Text:
Two of the major concerns that the healthcare system is facing nowadays are cancer and antimicrobial resistance (AMR) to antibiotics. Nanotechnology appears as a suitable solution, which might overcome some limitations of current available treatments. Despite of the advances in the nanoscale, there is a need to find alternatives to the traditional synthesis of nanomaterials, which suppose a threat to both the environment and society. In this context, Green Nanotechnology is presented as an answer, with cost-effective and environmentally-friendly approaches for nanoparticles synthesis.

In the present work, starch-mediated Tellurium nanowires were employed as a template for the *in-situ* growth of palladium and platinum nanostructures. The noble metal-chalcogenide nanocomposites were characterized for their biomedical applications, with both green-mediated synergetic composites showing antibacterial activity against AMR bacterial strains, both Gram negative (MDR *Escherichia coli*) and positive (Methicillin resistant *Staphylococcus aureus*) bacteria, at concentrations from 10 to 100 µg/mL over a 24-hour time period. Moreover, cell studies were done with human dermal fibroblast (HDF) and melanoma cells for 5 days, showing no significant cytotoxic effect at concentrations up to 25 µg/mL, while triggering a dose-dependent anticancer effect in the same rage of concentrations. Therefore, the use of noble metal-chalcogenide nanocomposites is proposed as a novel green nanotechnological-based platform for biomedical applications.

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